

Review of the Hatfield Customer location approach

- **ASSERTION:**
 - Dec 11th Paper was in error in regard to Metromail data
- **FACT:**
 - BCPM Sponsors developed that paper based on Metromail responses
 - Attached are Metromail documents
 - Used to generate the Tables
 - Invoices of the Data we were able to buy
 - The Metromail memo indicates that their data only contains White page listed addresses
 - This then omits Unlisted numbers which would make the 74 million records understandable
 - Highlights the fact that the data is proprietary
 - We followed the limited HM5.0 documentation
 - Data is expensive
 - Data is suspect
 - We went to their source
 - Even Hatfield filed Metromail numbers do not match
 - Ex-parte lists different state totals as well as national total (98.2 versus 98.8)
 - Dec 11th paper has been updated to incorporate latest HM5.0 data and latest analysis
 - The Metromail database of household addresses used by the Hatfield Model developers does not include the address of every housing unit in the country. In fact, the share of total U.S. housing units for which Metromail has an address is smaller than the figure touted by the proponents of the Hatfield Model.
 - An "address" in the Metromail database can be a P.O. Box or Rural Route. These addresses cannot be accurately geocoded. Hence, the number of geocodable addresses is smaller than the number of addresses in the Metromail database.
 - The Metromail address database contains both urban and rural addresses. The share of housing unit addresses can be substantially smaller in the rural areas than in the urban areas. Moreover, the geocodable share of housing unit addresses in rural areas can be even smaller given the preponderance of P.O Box and Rural Route addresses in rural areas.
 - Since it is more likely that a large share of Census housing units cannot be spatially located in rural areas, the Hatfield 5.0 customer location algorithm is reduced to an arbitrary algorithm, one that simply allocates locations that cannot be geocoded to the perimeter of the Census Block. This arbitrary algorithm is no different from the arbitrary algorithm in version 4.0 that allocated most of the low-density, Census Block Group housing units to 2 to 4 densely packed towns.
 - Since Census Blocks are very small in the urban areas, geocoding of customer locations in urban areas does not add much insight into the cost modeling process. In the rural areas, because of the low percentage of housing unit locations that can be accurately geocoded, geocoding is also not very useful. Hence, the only value added by the Hatfield Model 5.0, over version 4.0, is its use of Census Block data.
- **ASSERTION:**
 - HM approach is more accurate than BCPM
- **FACT:**
 - Assumption that Geocoding is more accurate is misleading.
 - They state that Geocoding is accurate to 6 decimal places
 - This is ~4.5 inches....WOW
 - Where costs matter most for Universal Service funding is in the Rural areas.
 - Geocoding does not work in Rural Areas
 - Our experts indicate that Rural Geocoding will be successful ~20% of the time
 - Therefore, in the rural areas, HM relies on arbitrary allocation to perimeter

- Asserts that this is just as good as BCPM and may be conservative
- Fact, Customers and plant are correlated with roads
Correlation between BCPM CB road mileage and CB HU is as follows (Kentucky data):

Density Range	Correlation
< 5	0.78
5 - 20	0.86
20 - 100	0.93
100 - 200	0.93
200 - 650	0.92
650 - 850	0.91
850 - 2550	0.92
2550 - 5000	0.90
5000 - 10000	0.81
> 10000	0.80

- Fact, Perimeter will understate costs due to overstatement of
 - Clustering
 - Ability of single T1 cable to serve customers that lined up on the Perimeter.
- Fact, many roads are on the interior of a Census Block
 - For the Total State of KY, the Ratio of Perimeter to Interior roads is 9:5
 - That is, ~37% are interior
 - For the Lowest density group, this ratio increases to ??????
- Even if HM assertions of data were true,
 - Only geocoding 70% of the 90% of residential customers that Metromail claims to possess
 - In other words, at most 63% of customers are geocoded to some unstated level of accuracy
 - Remaining are spread to perimeter using an undocumented/proprietary approach
 - Even though 63% of customers are geocoded, these are typically the urban/suburban customers from which as accurate of data could be obtained from Census data (Census Blocks are fairly small in urban area). Given that the HM 18k clusters have an assumption of equal dispersion indicates HM is less accurate than CB data.
 - The remaining 37% of the ungeocoded customers probably represent 70-80% of the land area that needs to be built to
 - In fact, for Albany and Vernon, the Geocoded points (16% of total for Albany and 67% for Vernon) only represented 0.4% for Albany and 17% for Vernon of the total land area.
 - See Attached.
 - Early indications for Albany and Vernon indicate that the BCPM correlation in the rural areas (<5) is above 70% while the HM model correlation's with actual SBC data is below 40%.
 - The word early is used because the HM values used in the correlation are based upon our best understanding of the undocumented/proprietary HM preprocessing steps.
- **ASSERTION:**
 - HM5.0 meets the 10 FCC Criteria
- **FACT:**
 - HM5.0 Customer data violates FCC tenet #8
- (8) *The cost study or model and all underlying data, formulae, computations, and software associated with the model must be available to all interested parties for review and comment. All underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible.*
- The Sponsors have tried to replicate, as best possible, the development of the HM data. This was filed in the Dec. 11 paper and has been updated with this filing.
 - We are now told by the HM sponsors (in their Dec. 23rd Ex-parte) we are using faulty data.
 - We contacted the stated HM5.0 sources: Metromail, Centrus, and even PNR.
 - We bought data from Metromail and Centrus

- There is no source code for the Preprocessing steps, including the clustering algorithms and the perimeter allocation of data algorithms
 - Attempts to secure the data from PNR for INDETEC's review of the data was unsuccessful.
 - We were told that the data is proprietary.
 - INDETEC even requested the summarized counts of the data by a higher geographic unit (CBG) and was told that it is proprietary.
 - See attached memo.
 - INDETEC attempted to replicate the process by contacting Metromail and Centrus. However we could not successfully do this
 - We could only review the successfully geocoded points (which was woefully lacking).
 - We do not know the approach used to allocate Households to the perimeter of the CB
 - As you have been told, we apparently did not request the data correctly from metromail as indicated by the HM ex-parte. Even though we have documented proof of the numbers we received, the Metromail people dispute their own numbers. We would check this out, but it is proprietary data that neither we nor the HM modelers have seen. PNR cannot release this data.
 - Too expensive
 - Too unreliable, Metromail has disputed their own numbers
 - Unknown algorithms still exists
 - How do you apportion the Census block data to the perimeter
 - How is clustering performed
 - BCPM is based on Census data and all preprocessing algorithms are on the public record.
- **ASSETION:**
- HM states that their designed plant relies on actual geocoded points. In fact, they state that BCPM grids are arbitrary while the HM clusters are based on actual points.
- **FACT:**
- HM relies heavily on Surrogate points. These points are fictitious, therefore clusters based on fictitious items must be fictitious.
 - Indeed, the placing of CB housing units on the perimeter may increase the models tendency to cluster, where in fact, the customers may be dispersed on interior roads and would not be clustered.
 - Even if they were real, HM discards all knowledge of customers.
 - They assume equal dispersion of customers within a cluster
 - Only items passed to the model are the area, aspect, and lots.
 - Thus, if clusters truly existed in HM Clusters, they are ignored.
 - See attached pictures of Waterford, PA
- **ASSERTION:**
- HM assertion that BCPM overbuilds and HM is more reliable is false
- **FACT:**
- BCPM is only model to use the road network as a limit to any possible overbuilding.
 - Results show that BCPM is more reasonable when compared with RUS
 - KY and GA results are attached.
- **ASSERTION:**
- HM stated that the CA data remains incomplete
 - "...if AT&T and MCI determine that corrections to these data affect significantly the per-line investment numbers reported herein, a revised filing will be made."
- **FACT:**
- We are not sure what this refers to but....
 - We did note that the HM only reports 457 Wirecenters for Pacific Bell, while the BCPM reports 613. This compares to what Pacific has indicated should be ~610. Upon further

investigation, it was noted that all Wirecenters from ENCTCAxx to LACRCAxx as well as those in the alphabetic range from PLNDCAxx to RVRBCAxx were not used.

- Is this what would count as a significant event to AT&T and MCI.

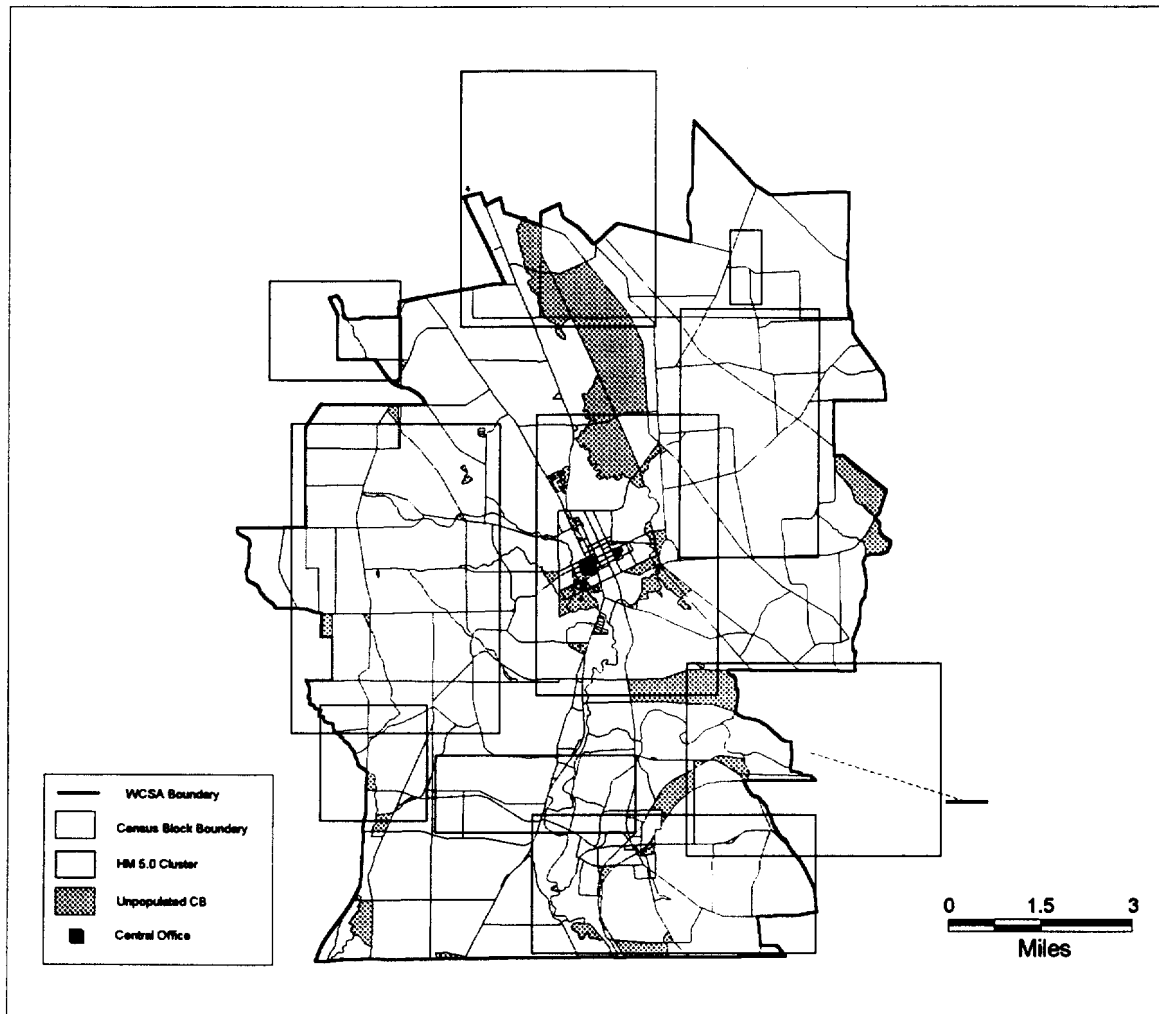
- **Other Items:**

- HM5.0 relies on the V&H orientation for feeder routes.
 - In Raliegh, NC, this is 33degrees off from the Cardinal Axis
 - In Boulder, CO, this is fairly close to the Cardinal Axis

This map displays the Los Angeles metropolitan area, including parts of Orange, San Bernardino, and Riverside counties. Each census tract is labeled with its 1990 population. Shaded areas indicate population density: solid black for the highest density (central downtown area) and cross-hatching for medium density (surrounding urban areas). The map shows a high concentration of population in the central urban core, with density decreasing as distance from the center increases. The population numbers range from 1 to 61, with many tracts in the central area having populations over 10,000.

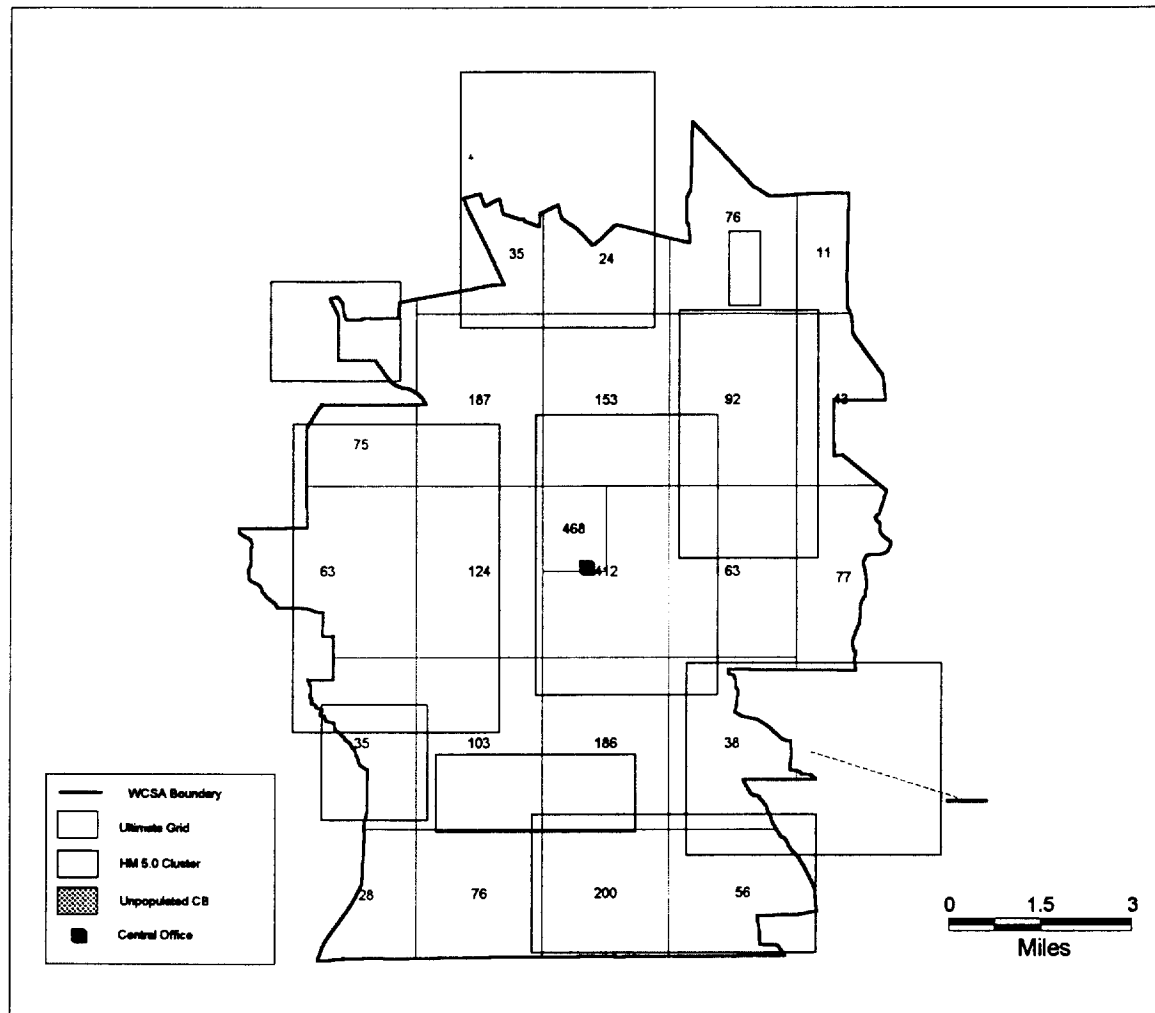
0 1.5 3
Miles

**Waterford, Pennsylvania Wirecenter
Hatfield Model 5.0**

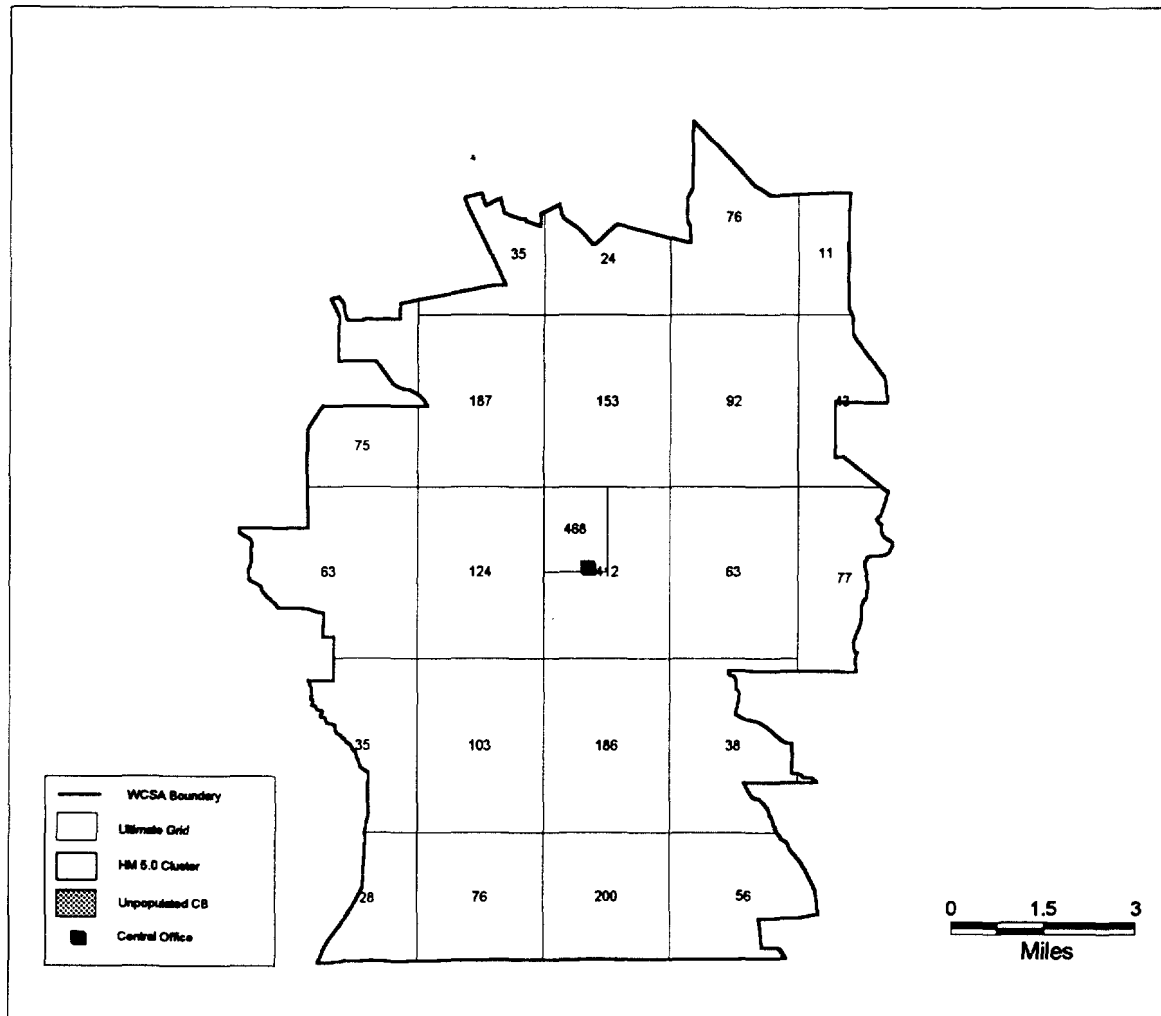


**Wirecenter PA_05345_02362
CLLI WTFRPAXW**

**Waterford, Pennsylvania Wirecenter
Hatfield Model 5.0 and BCPM 3.0 Ultimate Grids**



Waterford, Pennsylvania Wirecenter BCPM 3.0 Ultimate Grids



Wirecenter PA_05345_02362
CLLI WTRPAXW

Hatfield's Remarkable Cardinal Points

As in previous versions of the Hatfield Model, version 5.0 runs up to four main feeders from a wire center, in directions that differ by 90 degrees. In previous versions, those directions were a true north, east, south, and west, reflecting the fact that main feeders typically run along streets and roads, and that the most common orientation of streets and roads in America is north/south and east/west.

But, inexplicably, in version 5.0, Hatfield chooses to run the feeders *not* in cardinal directions, but along the *V & H Axes*: "feeder routes are assumed to emanate from the wire center along the V & H axes" (footnote 45, page 44 of *Model Description*).

Now the V & H Coordinate System, an elliptical projection created by J. R. Donald of A.T.& T. in the 1950's for convenience in calculating airline mileage between wire centers, is used widely in the telecommunications industry for identifying point locations (the location of each switch in the LERG is specified in V & H coordinates). But I have yet to see a town or city laid out along V & H coordinate lines.

The Hatfield documentation makes light of the difference between the V & H directions and the cardinal directions: "These [V & H] axes are rotated *slightly* clockwise relative to latitude and longitude axes" (next sentence in the same footnote). SLIGHTLY??! It depends on where you are in the United States. In Seattle, for example, it really *is* only slightly, while in Raleigh NC, the V & H axes are rotated *more than 33 degrees* clockwise. The variation is considerable because this is a *different* coordinate system from latitude and longitude ... and, in general, the directions are a considerable departure from north, east, south, west.

**METROMAIL**

901 West Bond Street
Lincoln, Nebraska 68521
Telephone 402.473.9721
800.316.2637
Facsimile 402.473.9796

Entire USA
data

FAX Cover Shee

Date: 12/3

From: **Rhonda Betz**

Please deliver the following pages to:

Name: Alyson Coons Fax: 619-404-0749

Phone: _____

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Rhonda Betz, ext. 4047

Telephone: 402.473.9721 800.316.2637

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STATE	1997 HOUSEHOLDS	1996 HOUSEHOLDS	1995 HOUSEHOLDS	1994 HOUSEHOLDS	1993 HOUSEHOLDS	1992 HOUSEHOLDS
ALABAMA	1,136,471	1,136,471	627,332	992,921	929,768	192,333
ALASKA	94,984	94,894	39,009	73,576	73,805	20,524
ARIZONA	1,113,805	1,113,805	790,069	849,551	756,629	305,247
ARKANSAS	702,468	702,468	421,528	625,485	591,895	108,383
CALIFORNIA	6,502,423	6,502,423	4,854,768	3,732,101	4,707,059	1,395,012
COLORADO	1,158,787	1,158,787	1,010,711	904,272	774,670	311,872
CONNECTICUT	1,055,291	1,055,291	794,373	912,721	712,555	314,732
DELAWARE	184,058	184,058	204,442	146,183	143,500	33,898
DISTRICT OF COLUMBIA	207,843	207,843	132,905	162,535	65,620	119,006
FLORIDA	4,735,040	4,735,040	4,536,354	3,580,026	3,094,052	1,214,141
GEORGIA	1,855,926	1,855,926	1,155,391	1,539,136	1,509,913	315,626
HAWAII	257,517	257,517	77,645	222,791	117,389	124,756
IDaho	335,523	335,523	297,506	295,304	266,188	68,243
ILLINOIS	3,441,769	3,441,769	3,551,541	2,813,650	2,302,658	959,274
INDIANA	1,713,996	1,713,996	1,245,184	1,443,798	1,365,571	340,078
IOWA	997,394	997,394	1,056,748	898,221	770,522	223,515
KANSAS	814,087	814,087	758,988	702,744	650,334	161,350
KENTUCKY	1,105,204	1,105,204	1,033,883	938,875	888,218	200,773
LOUISIANA	1,198,541	1,198,541	1,220,974	1,001,519	930,643	255,288
MAINE	461,795	461,795	256,280	421,442	367,592	92,024
MARYLAND	1,547,206	1,547,206	1,630,782	1,181,275	1,049,384	396,543
MASSACHUSETTS	1,986,744	1,986,744	2,117,636	1,691,168	1,139,247	744,849
MICHIGAN	2,816,709	2,816,709	3,173,770	2,217,083	2,243,277	545,127
MINNESOTA	1,654,119	1,654,119	1,670,494	1,486,569	1,142,271	461,543
MISSISSIPPI	665,505	665,505	461,770	591,477	556,688	104,189
MISSOURI	1,676,534	1,676,534	1,714,044	1,372,371	1,324,930	316,353
MONTANA	284,994	284,994	146,528	256,516	216,890	67,666
NEBRASKA	557,127	557,127	326,906	497,815	432,565	120,728
NEVADA	320,856	320,856	275,627	181,472	213,909	96,795
NEW HAMPSHIRE	392,564	392,564	282,069	346,344	291,522	97,386
NEW JERSEY	2,282,496	2,282,496	1,525,790	1,741,883	1,552,495	550,353
NEW MEXICO	396,066	396,066	246,383	334,116	304,480	86,090
NEW YORK	5,221,639	5,221,639	3,603,442	4,516,592	2,743,176	2,199,715
NORTH CAROLINA	1,980,185	1,980,185	1,237,596	1,738,429	1,631,500	325,862
NORTH DAKOTA	237,393	237,393	189,911	216,850	166,127	70,139
OHIO	3,437,918	3,437,918	3,775,492	2,830,130	2,617,161	746,839
OKLAHOMA	939,910	939,910	625,056	798,937	770,950	153,534
OREGON	911,509	911,509	960,249	675,401	680,705	215,271
PENNSYLVANIA	3,767,022	3,767,022	3,128,029	3,144,406	2,951,631	695,573
RHODE ISLAND	319,129	319,129	237,642	283,908	205,658	111,072
SOUTH CAROLINA	1,011,833	1,011,833	924,198	843,365	809,231	184,683
SOUTH DAKOTA	240,613	240,613	121,728	226,222	184,185	55,918
TENNESSEE	1,476,805	1,476,805	1,090,114	1,267,203	1,202,391	243,668
TEXAS	4,837,260	4,837,260	4,923,460	3,778,870	3,502,379	1,174,725
UTAH	493,984	493,984	370,145	432,166	361,702	118,893
VERMONT	189,221	189,221	42,338	181,944	164,359	24,017
VIRGINIA	1,815,120	1,815,120	1,406,814	1,472,041	1,403,464	352,288
WASHINGTON	1,476,309	1,476,309	1,187,026	1,232,233	1,048,708	409,289
WEST VIRGINIA	516,222	516,222	373,095	472,845	446,832	68,284
WISCONSIN	1,764,155	1,764,155	1,616,235	1,526,217	1,238,359	498,195
WYOMING	149,279	149,279	64,472	135,170	111,467	37,271
TOTALS	74,439,258	74,439,258	63,514,472	59,927,769	53,724,414	18,028,933

low
old's
11/997
4/Nov



Date: December 10, 1997

To: Alyson Coons/Indetec International

From: Sue Brown

Subject: Price Quote

\$150,000 for the entire nation (order all at once)

7.50/m records per states ordered individually (based on national guarantee)

We can output this data on a magnetic tape or a cartridge. Metromail will output the USPS Standardized Address to help with your matching logic for your geo-coding. This price is based upon you use in your program for geo-coding.

Metromail's database is compiled primarily for the use of direct marketing. First I would like to explain how the National Consumer database is compiled. The National Consumer DataBase is compiled from white pages in phone directories, drivers license data, tax roll information from county courthouse records, and census data. We are very aggressive in updating at a rate of 65 times per year. As a licensee of the post office for National Change of Address we update every 4 weeks.

There are some areas that you need to be aware of when looking at our file for geocoding for your program. Some households list just their name and phone number in the phone source so we will not have their address. Metromail does not capture non-published phone numbers and addresses. We had already discussed the issues with PO Boxes and Rural Route addresses.

Please let me know if you need additional information for this quote. I look forward to working on this project with you first quarter of 1998. You can reach me directly at 800-684-9384.

Sue

C O U N T S

DATE: 12/04/97

USER ID: LIORDB0

ALYSON COONS

PHONE: 619-658-0669

***** CLIENT INFORMATION *****

ATTN: ALYSON COONS

INDETEC INTERNATIONAL

5783 PARK PLAZA COURT

INDIANAPOLIS IN 46220-0000

PHONE: (619) 658-0669

FAX #: (619) 404-0749

***** ** INSTRUCTIONS **

TOTAL COUNT

49,313

TOTAL PHONES

40,230

SELECT NCDB RECORDS

KEEP GHOST RECORDS

SORT SEQUENCE: DEFAULT

COMMENTS:

PROCESSING INSTRUCTIONS:

REFER TO COMMENTS ABOVE

GEOGRAPHY - SELECT BY STATE/COUNTY:

MT059 MEAGHER MT087 ROSEBUD NC083 HALIFAX NC193 WILKES ND073 RANSOM
 ND089 STARK UT039 SANPETE UT051 WASATCH

***** ** COUNTY COUNTS **

MT059	MEAGHER	98	1,257	MT087	ROSEBUD	1,348	1,358
MT	STATE TOTAL	1,446					
NC083	HALIFAX	11,597	23,136	NC193	WILKES	19,372	23,439
NC	STATE TOTAL	30,969					
ND073	RANSOM	786	2,569	ND089	STARK	8,550	9,523
ND	STATE TOTAL	9,336					
UT039	SANPETE	3,776	7,810	UT051	WASATCH	3,786	5,161
UT	STATE TOTAL	7,562					

MT, ND, NC &
 UT
 data

NATIONAL CONSUMER DATA BASE SELECTION INVENTORY COUNTS

PAGE: 1

STATE	ZIP	COUNT	CUSTOMER	ORDER	STATE	ZIP	COUNT
NC	27823	1,725	122393	01	NT	59053	49
	27839	481				59083	6
	27843	219					
	27844	343				SCF 590 TOTAL	335
	27859	27					
	27870	6,330				59312	13
	27874	1,531				59323	51
	27887	12				59327	935
	27890	929				59333	1
						59347	62
	SCF 278 TOTAL	11,597					
						SCF 593 TOTAL	1,862
	28606	493					
	28624	559				59642	9
	28635	1,057				59645	40
	28649	331					
	28651	1,747				SCF 596 TOTAL	49
	28654	821					
	28659	6,933				STATE TOTAL	1,446
	28665	478			UT		
	28669	768				84032	2,642
	28670	856				84049	960
	28683	438				84082	184
	28685	579					
	28697	4,112				SCF 840 TOTAL	3,786
	SCF 286 TOTAL	19,372					
	STATE TOTAL	30,969				84621	5
ND	58027	562				84627	1,087
	58033	14				84629	527
	58054	28				84634	41
	58057	62				84642	885
	58068	118				84643	11
						84646	6
	SCF 580 TOTAL	786				84647	1,190
						84662	24
	58601	7,524					
	58622	140				SCF 846 TOTAL	3,776
	58630	162					
	58641	43				STATE TOTAL	7,562
	58652	376				CUSTOMER TOTAL	49,313
	58655	151					
	58656	154					
MT	SCF 586 TOTAL	8,550					
	STATE TOTAL	9,336					
	59003	154					
	59012	10					
	59039	9					
	59043	107					

C O U N T S

DATE: 12/04/97

USER ID: LIORDB0

ALYSON COONS

PHONE: 619-658-0669

***** CLIENT INFORMATION *****

ATTN: ALYSON COONS

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5783 PARK PLAZA COURT

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PHONE: (619)658-0669

FAX #: (619)404-0749

** INSTRUCTIONS **

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TOTAL PHONES

40,230

SELECT NCDB RECORDS

KEEP GHOST RECORDS

*

*

*

*

SORT SEQUENCE: DEFAULT

*

*

COMMENTS:

*

PROCESSING INSTRUCTIONS:

REFER TO COMMENTS ABOVE

*

*

*

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GEOGRAPHY - SELECT BY STATE/COUNTY:

MT059 MEAGHER MT087 ROSEBUD NC083 HALIFAX NC193 WILKES ND073 RANSOM

ND089 STARK UT039 SANPETE UT051 WASATCH

*

*

*

*

NC STATE TOTAL 30,969

ND STATE TOTAL 9,336

MT STATE TOTAL 1,446

UT STATE TOTAL 7,562



901 West Bond Street
Lincoln, NE 68521-3694

Date: 12/04/97

Time: 14:19:14

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File Characteristics:

Client Name.....	INDETEC INTERNATIONAL	P08501
Job Number.....	I2239301	06103364
Creation Date and Time.....	12/3/97	7:04:44 AM
File Name.....	NAMES	
Diskette Number.....	#1 of 1	
Record Count.....	5863	

Output:

MS-DOS command.....	copy
File Transfer facility.....	LanRes
End of record command.....	CRLF
Computer language.....	ASCII
Record length.....	184

*Texas
data*

Diskette Physical Characteristics:

Machine type.....	Hewlett Packard
MS-DOS version.....	6.2
Diskette type.....	3.5 High double sided 1.44 Megabyte capacity